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THE ROTIFERA OF SANDUSKY BAY.

(SECOND PAPER.)

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The paper offered last year, Pittsburg meeting,¹ on The Rotifera of Sandusky Bay, was a list, with notes, of sixty-seven identified species. The present paper adds to that list the species since studied and extends it to 106 species, of which four are supposed to be new to science. Among the forms hitherto known are several rare and striking ones, some of which have not been before recorded as occurring in this country. Several have but recently been discovered in Europe, while one was described in 1893 from China, thus adding one more antipodal species. The additional facts here presented will, I think, prove interesting to students of distribution of these charming animals.

A casual glance at the 106 names in this local list will at once show that a majority of them are among the striking forms; the more obscure ones have not been wholly neglected; and a few have been determined, but the sure identification of many others must be tested by further examination. It appears to the writer that many of these less conspicuous species are not as yet described.

The chief method used in collecting was by means of the "tow-net," hauled at the surface and at stated depths, mainly at or near the surface. By hauling over the same course day after day, at stated times, and under the extremes of summer temperature, the successions and variations noted in the rotiferal fauna have proven interesting, and under the

1. Proceedings American Microscopical Society, Vol. XVIII., page 155.

species name remarks are introduced on the time, place and condition of capture. It is anticipated that after another summer's observations are recorded the facts deduced will be sufficiently important to warrant publication.

The nets used were made of silk-bolting cloth of the best quality, having about sixty meshes in a centimeter. The tow-net was made of the same diameter as the ordinary plankton net, twenty-five centimeters. The gatherings by this net were immediately passed to coarser and finer nets, in order to remove small insects and the larger entomostraca, as these active creatures soon exhaust the oxygen and overcome the more delicate Rotifera. The "sorted" material was then put in rather large bottles separately and fragments of aquatic plants introduced. The wheel-animalcules were found to remain alive under these conditions a sufficient length of time. When brought to the table for study the Rotifera were again concentrated by passing the large quantity of water from the bottles through sieves of the finest silk; the pipette would then remove the last few drops from the apex of the conical sieve to the slide or compressorium highly charged with the forms desired.

For narcotising these animals hydrochlorate of cocaine, 1.5 per cent. strong, was employed with very satisfactory results. Quieted in this way they are in excellent condition for study, or may then be fixed and stained in good condition.¹

68. *Floscularia edentata*, Collins.

Under leaves of water-lily in a small pond between the parallel dunes at Cedar Point. It was not uncommon in this pond, but not found elsewhere.

APSILUS, Metschnikoff.

69. *A. bipera*, Foulke.

Few taken in tow-net at the surface among aquatics in the

1. See paper by Rousselet, Quek. Mic. Club, Vol. V., page 205.

cove near pumping station. I follow Dr. Stokes in separating *bipera* from its congeners.¹

One was taken with a young within in which the two large red eyes were conspicuous.

STEPHANOCEROS, Ehrenberg.

70. *S. Eichhornii*, Ehrenberg.

Comparatively rare. It occurred on dissected leaves of aquatics in quiet, clear water.

71. *Melicerta ringens*, Schrank.

Few seen ; all on *Utricularia* from "Black Channel."

72. *M. tubicularia*, Ehrenberg.

This beautiful creature was common on *Utricularia* in shallows on Cedar Point. *M. floccosa*, described in the first paper, is clearly distinct.

73. *Æcistes umbella*, Hudson.

Not uncommon with the last.

74. *Conchilus unicornis*, Rousselet.²

Exceedingly abundant in surface tows in all parts of the bay, more especially over clear, shallow areas.

75. *C. dossuarius*, Hudson.

Rare. Only in surface tows in Biemüller's Cove, Cedar Point. The separated part of the antenna is much longer than Dr. Hudson's figure indicates.

MIKROCODIDES, Bergendal.

76. *M. dubius*, Bergendal.³

Not uncommon in a permanent pond in the sand, surrounded by high dunes at Cedar Point.

ASPLANCHNA, Gosse.

77. *A. priodonta*, Gosse.

Very common in surface tows in all parts of the bay.

1. See Journal R. M. S., Vol. XVI., page 269.

2. Journal Quek. Mic. Club, Vol. IV., page 367.

3. Rotatorienfauna Groenlands, page 34.

78. *Sacculus orbicularis*, n. s., Fig. 1.

Length of retracted animal, .124 mm. ; width of lorica from the side, .114 mm.

From the side the outline is circular, with a neck-like projection anteriorly ; the width of the neck about one-third as wide as the body, its edge is coarsely crenated, the rounded processes being alternately larger and smaller. From above the outline is oblong, its transverse diameter about one-half that of the vertical height. The lorica is thick and firm, resembling in this regard that of *Anapus ovalis*, but no division into plates could be made out.

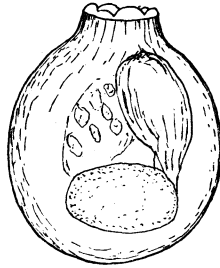


FIG. 1.

The corona has the cilia in tufts, and from near the dorsal surface arises a long, straight antennal process ; the rather small mastax is furnished with very slender trophi ; the large stomach and conspicuous ovary occupy nearly the whole space of the lorica. The whole animal has a slightly reddish hue.

Very many were taken in the tow-net in Biemüller's Cove during July. Very few were seen alive, as they are not at all hardy and would be found, with careful treatment, inactive or dead when carried from the place of capture to the microscope, a mile away. It is an interesting form and one that should have more thorough study than I have been able to give to it as yet. It appears to differ sufficiently from all described forms and is placed in the genus *Sacculus*, with grave doubts as to its affinities.

79. *Synchaeta pectinata*, Ehrenberg.

Constant and plentiful in hauls at the surface of clear water.

80. *S. stylata*, Wierzejski.

With the last and usually more abundant.

81. *Plæsoma truncata*, Levander.²

Few seen in surface tows about Cedar Point, June 24th. Sketches were made before it was discovered to be *truncata*; the identification was satisfactory in every particular. Taken with *P. lenticulare* and the next.

82. *P. mollis*, n. s.

Length of lorica, .24 mm.; of foot to end of toes .14 mm.

The body is oblong, in side view trumpet-shaped as it widens toward the corona, which is relatively very deep. The lorica is very thin and flexible; it is coarsely areolate, the round depressions are between ridges which longitudinally follow the curves of the valves; there are three faint transverse elevations in the middle of the dorsum; the neck-shield is narrow with anterior margin obtuse. The posterior end of the body may be protruded until the part is very nearly pointed or drawn in until quite obtusely rounded. The stout foot ends in long, pointed toes; it issues between the lateral plates of the lorica near the middle of the venter, and extends a little farther back than the extended body. The very broad corona has a powerful wreath and tufts of cilia; there is a stout antenna on either side and several (probably six) large decurved setæ between them. Situated ventral of these are others (probably the same number), smaller and decurved. The delicacy of the lorica renders the internal structure quite visible; the anterior part is transparent, in which the large three-lobed brain, with a prominent eye situated on the anterior part of the middle lobe, is seen, and below the oblong

1. Akademie d. Wiss. in Krakau, 1892.

2. Acta Societatis pro Fauna et Flora Fennica, Vol. XII., page 25.

mastax with the powerful trophi ; the posterior part is occupied by the less transparent alimentary canal and ovary.

It occurred sparingly towards the end of July, taken only in surface hauls in clear water over weeds. It is a powerful swimmer and on the slide goes tearing about in a resistless way among the weaker forms. I have followed Jennings in placing *Plæsoma* in Hydatinidæ, not feeling satisfied, however, with the arrangement.

NOTOPS, Hudson.

83. *N. minor*, Rousselet.¹

Very abundant in surface tows in clear water at Cedar Point. It is a very pretty species, resembling in outline and actions a species of *Sacculus* ; the anterior border of the thick cuticle is crenate.

84. *Notommata vorax*, Stokes.²

The animal agrees well in size, form and surface, with Dr. Stokes' description. It occurred in tows among the weeds in all parts of the bay.

85. *Copens Ehrenbergii*, Gosse.

Few among *Utricularia gibba* from a pond at Cedar Point.

86. *Proales algicola*, n. s.

The body, when swimming or when pushing through the mucilaginous matrix of *Anabæna*, in which it lives, is nearly cylindrical, slightly truncated posteriorly and somewhat broader anteriorly. When quietly feeding the ventral line is straight or slightly arched and the dorsal is strongly arched, the body being thickest behind the middle. Seen from above the outline, when quiet, is oval, narrower in front, the "head" separated by a constriction ; the head part is somewhat conical, and a short distance back of the position of the eye there is a transverse ridge ; there is a longitudinal fold

1. Jour. Quek. Mic. Club, Vol. IV., page 359.

2. Ann. and Magazine of Nat. Hist., S. 6, Vol. XIX., page 628.

on each side of the back. The face is slightly oblique, the mastax ovate, the trophi strong, virgate, and when the animal is feeding approach closely, but do not quite reach the front. The eye is large, red, and in two parts, separated by a space equal to the diameter of the parts; it is on the front of the brain on a level with the apex of the jaws. The foot and toes are minute; the latter are pointed and barely reach the end of the body when turned back.

The body is hyaline, except as obscured by the rich yellow-brown of the large stomach and intestine. Older examples are tinged with this color throughout; the very young are colorless, but soon take color after they begin to feed on the alga.

Anabæna gelatinosa, Wood, often occurs in such vast quantities in the harbor that the water is deep green. In the gelatinous masses the rotiferon resides, feeding and depositing its eggs in a way similar to *Hertwigia parasita* in *Volvox globator*. It was not unusual to find several adults, young, and eggs in a single frond. The eggs are relatively large. When the alga is broken up the rotiferon swims freely and rapidly in search of another suitable home. This species was found in one other habitat. On the Peninsula at Marblehead there are very deep and wonderfully complex glacial grooves in the limestone. In one of these, known as the "bath-tub," I found the water turbid with a small, green, unicellular alga; in this menstruum were a few of this rotiferon having the characteristic color. The species appears to be near *P. otodon*, but is sufficiently distinct.

EOSOPHORA, Ehrenberg.

87. *E. aurita*, Ehrenberg.

Very abundant from strainings from cove near pumping station.

DIGLENA, Ehrenberg.

88. *D. forcipata*, Ehrenberg.

With the last; not very common.

HERTWIGIA, Plate.

89. *H. parasita*, Ehrenberg.

Not uncommon in *Volvox globator*, which occurs throughout the marshy portions of the bay. This interesting little rotiferon was found, April 3, 1897, in great numbers in a small artificial pond of two years' standing, fed by spring water, in Minerva Park, Columbus, O. The host was so numerous that it gave a green color to the water. To determine the extent of the invasion I counted five lots of 100 each and found in the 500, 188 that were occupied. As some of these had more than one guest, and often from two to five eggs, there were about as many parasites, counting eggs, as hosts. Mr. Gosse remarks in *The Rotifera*, Vol. II., page 39, that "the *Volvox* appears to suffer little from the depredations of its ungrateful guest." This can hardly be true, for in colonies of this collection that had many occupants the surface zooids were more or less destroyed, the clusters gone or mangled; the whole colony looked sickly and discouraged. Ten days after the first visit I returned to the same pond and could only find an occasional *Volvox* and not an occasional *Proales*. Where were hosts and guests?

90. *Mastigocerca rattus*, Ehrenberg.

This elegant species was taken a few times in tows made in clear water over weeds.

91. *M. bicristata*, Gosse.

Not uncommon near shore. Our rotiferon does not agree well with Mr. Gosse's figure, as the carinæ do not extend so far back and the outline shows a stouter form.

92. *M. elongata*, Gosse.

Few in cove at pumping station. A most beautiful species.

93. *M. multirinis*, n. s. Figs. 2 and 3.

Length, .184 mm. ; greatest width, .120 mm. ; length of toe, .100 mm.

Lorica from above ovate, nearly symmetrical, anteriorly constricted to a cylindrical neck. There are a few faint carinae dividing the surface into coarse facets; there are also faint longitudinal lines, somewhat irregular in direction, giving the surface the appearance of watered silk. These markings are seen only under favorable illumination. The anterior dorsal edge of the lorica has a stout tooth and two crena-

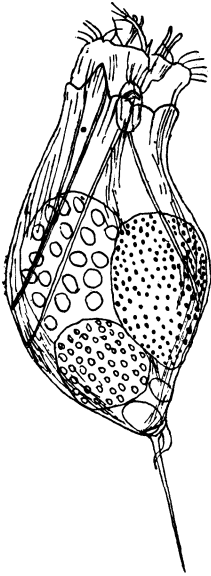


FIG. 2.

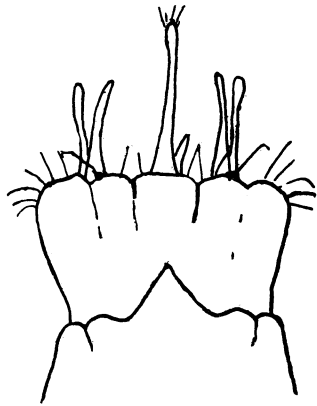


FIG. 3.

tions each side; the same border below has centrally a large round process and each side of this two similar and smaller ones. The posterior end is obtuse with a constricted part. In profile the dorsal outline is convex, the lower border convex, but on a shorter curve from base of the "neck" to the foot. The toe is long and straight, with three spines at the base: one short, stout, curved over the toe, then turned back; the others are minute scales.

The large red eye is apparently upon the brain; the mas-tax is oblong and the trophi powerful, of the usual type. In some examples the anterior of the body is hyaline and as

glass-like as in *Asplanchna*; in others the large ovary and large brown stomach occupy nearly the whole body space. In the transparent ones the retractor muscles of the corona and the œsophagus are readily traced. The corona has a peculiar supply of antennal appendages: in the middle of the upper border there is a long, straight process, with obtuse apex; below this is a short and more pointed process and either side a pair of long, slender appendages, the upper and inner one of each pair is somewhat curved towards the middle and the apex is nearly acute; the other one is slightly enlarged apically. These are equal in length and slightly shorter than the first.

The cilia are powerful, arise from large processes placed laterally; a lunate one above, conical ones below.

The species is a strong swimmer and occurs sparingly in coves, taken at the surface. It should be compared with *M. lata*, Jennings, from Lake St. Clair. It certainly resembles that species, and if the describer of *lata* had not given such an exact and detailed description they might easily have been confused. The present species is broader and the toe shorter, the toe spines quite different, the lorica is more nearly symmetrical, with its anterior border totally different and also the coronal appendages.

Compared to other species of *Mastigocerca*, *multicrinis* and *lata* appear to belong elsewhere. They are the only ones with their peculiar type of lorica and with such complex coronal appendages.

DINOCHARIS, Ehrenberg.

94. *D. pocillum*, Ehrenberg.

Abundant from near the bottom in shallows.

POLYCHÆTUS, Perty.

95. *P. subquadratus*, Perty.

Rare. Taken in tow-net among aquatics.

96. *P. serica*, Thorpe.¹

Very numerous in tows among vegetation in clear water at Cedar Point ; also in ponds in the sand.

97. *Stephanops muticus*, Ehrenberg.

Not common. Besides the usual or normal form there are those that are broad and exactly of the outline of *S. Groenlandicus*, Bergandal, except it has the neck of *muticus*. This variety needs further study and comparison.

98. *Cathypna leontina*, Turner.²

Abundant in a pond on Cedar Point and in Black Channel. Rare elsewhere. This appears to be *C. scutaria*, Stokes.

99. *Distyla spinigera*, Western.³

Not common ; only taken in pond on Cedar Point. This perfectly distinct species is a handsome addition to our rotatorial fauna.

NOTAGONIA, Perty.

100. *N. Ehrenbergii*, Perty.

This unique form was often found among plants from Cedar Point. I can see no reason for separating it from *Metopidia* as the angles of the lorica are, as it seems to me, simply specific and as the paired organ, described as projecting from the head, appears to be only the usual hood.

101. *Brachionus angularis*, Gosse.

Exceedingly abundant in surface hauls in cove at pumping station. I at first took it for *B. mollis*, Hemple.

102. *B. pala*, Ehrenberg.

Not common, with the last. Both the normal form and the variety without the lateral posterior spines occurred.

103. *B. tuberculatus*, Turner.⁴

Rather more common than *pala* in the same locality. A

1. Journal R. Mic. Soc., Vol. XIII., page 152.

2. Bull. Scientific Labs. of Denison University, Vol. VI., page 61.

3. Jour. Quek. Mic. Club, Vol. V., page 427.

4. Bull. Scientific Labs. of Denison University, Vol. VI., page 65.

fine species. I cannot agree with the distinguished authority who places this as a variety of *B. bakeri*. Mr. C. C. Mellor, of Pittsburg, found this form in the canal at Newark, O., August 24, 1888, and later sent me an accurate sketch which I have still.

104. *Anuræa tecta*, Gosse.

Few only of this distinct species seen, taken in tows at Black Channel.

NOTHOLCA, Gosse.

105. *N. longispina*, Kellicott.

Few in strainings from water-supply and occasionally one from Cedar Point. It is common at times in Lake Erie and one might expect to find it more commonly in so large a bay, open so freely to the main body.

FAMILY XX. PEDALIONIDÆ.

PEDALION, Hudson.

106. *P. mirum*, Hudson.

A few were taken in nearly every haul made in clear weather near Pumping-station Cove.

This is one of the finest additions to our fauna.

Remarks on certain species of the first list :

Floscularia Millsii was abundant last year, but could not be found in any part of the bay after much search. Mr. Jas. B. Shearer, of Bay City, Mich., found it plentifully at his station in June, 1895.

Melicerta floccosa has not been found again. This I regret, for there should be further study of it and a figure.

Stephanops chlæna has not again appeared. It has been suggested to me by a gentleman thoroughly conversant with these animals, that I may have had in hand *Mikrocodides dubins*. I certainly have the latter species now and still expect to find *chlæna*.